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TITLE: System for and method of collecting and populating a database with physician/patient data for processing to improve practice quality and healthcare delivery

Abstract Text (1):

A system and method relates to the field of building and administrating a patient management and health care management database containing data relevant to the clinical care of patients, to the management of the practices to which the patients belong, and to outcomes of that health care and practice management. The disclosed system encompasses (i) designing and administering paper and pen and hand held computer survey instruments; (ii) administering and collecting completed surveys (iii) building and managing a database of information collected from the surveys; (iv) analyzing data collected from the surveys; (v) and providing clinical practices with summary information. Summary information may be used to improve patient care, health outcomes, and the management of physician practices.

Brief Summary Text (2):

This invention relates to the field of database population and processing, and more specifically to receiving and processing physician clinical and patient care survey information, populating and managing a database of such information, and providing health outcomes and clinical practice information for physician patient care and practice quality improvement.

Brief Summary Text (4):

Today, the health care industry focuses on designing programs and products to manage patient problems in a useful, efficient, cost-effective and consumer-oriented manner. Hospital staff members, numerous health care providers and representatives of pharmaceutical research and development industry play an important decision-making role in determining the treatment for disease. However, that role is still ancillary to the patient's primary care physician who diagnoses the patient's problem and provides an individualized treatment regimen. Current treatment for many kinds of patients' problems reflects the health care industry's change of perspective from an episodic, systematic treatment of disease to the reduction of risk factors the prevention of disease, and the reduction of health care costs. A rapid dissemination of large amounts of information regarding the effectiveness of treatment regimens, the cost-effectiveness of these regimens, and of patient reactions to their health care complements this change of focus.

Brief Summary Text (5):

As a result of the focal change, many participants within the healthcare industry require rapid access to a large database of patient information about diagnosis, treatment, health outcomes, costs, and patient perspectives on their diagnosis, treatment within the context of the practice to which they belong. This information can be used to respond to research/practice generated questions regarding some or all of the following: (i) the most effective treatment for a disease or patient problem, (ii) regimens or methods of reducing risk and increasing adherence (iii), the costs to the practice associated with therapeutic regimens, (iv) degree of patient satisfaction, and patient satisfaction with and adherence to regimens, (v) differences of (i-iv) within different practice types, specialties, or geographic regions. The information falls into three areas: clinical information, physician/patient information, practice management/cost information, and health outcomes information.

Brief Summary Text (6):

Available survey methods and databases that collect and analyze these surveys have not been designed in a user-friendly, easily accessible manner that physicians can use to

monitor patients and their practices. The primary sources for patient information have been hospital records/data; pharmaceutical industry studies, prescription information, and medical or healthcare provider claims databases. These databases often lack information about one or more of the following: diagnosis, treatment, the patient's perceptions of the diagnosis and treatment, and costs to the practice of the patient's care and perceptions of care. The research activities requiring this information may take many forms: determining which treatment for a disease is most effective, determining the costs associated with particular kinds of treatment, or identifying at-risk patient and patients' reactions to the diagnosis, treatment, and services provided.

Brief Summary Text (8):

Past efforts to assemble such a database and system have failed because of a difficulty of acquiring such information without interfering with the physician's practice. Industry attempts to install computers within a practice, or assemble the information through surveys suffer from the following problems. First, physicians have been trained to prepare an immediate and long range patient plan based upon their own knowledge rather than to gather survey information from patients. Second, physicians know the importance of keeping patient information confidentially and, therefore, will not readily divulge information from their patient records. Third, physicians have no easy way to relate one portion of the care they provide (e.g., how the patient is greeted) to another aspect of care (e.g., patient adherence to a regimen.) Fourth, if the physician directly asks a patient about the office services and clinical care, the patient may not give accurate and unbiased responses. Therefore, there is a need for a method of acquiring Physician/Patient/Practice information which a) is simple to implement (requires only a few minutes of the physician's and the patients' time); and b) maintains the confidentiality of each patient.

Brief Summary Text (10):

The present invention relates to a system and method for acquisition, management and processing of patient clinical information and patient satisfaction information received from a group of physician practices to provide practice performance information. The system and method include a data input process receiving data including a physician component having the patient clinical information and a patient component having the patient satisfaction information to provide practice-patient data; database processing which translates the practice-patient data to a predetermined format and stores the practice-patient data having the predetermined format in a database; and a data analysis process. The data analysis process includes a) selectively receiving practice-patient data from the database, b) analyzing the received practice patient data, and c) summarizing the patient satisfaction data to provide performance results. The system and method further include a data correlating process which correlates selected portions of the performance results associated with at least one of the group of physician practices with portions of the stored practice-patient data to provide a practice measure; and a report generation process to provide a report from the performance results and the practice measure.

Drawing Description Text (7):

FIG. 3A illustrates a first portion of an exemplary embodiment of a database file layout used in one embodiment of the present invention;

Drawing Description Text (8):

FIG. 3B illustrates a second portion of an exemplary embodiment of a database file layout used in one embodiment of the present invention;

Drawing Description Text (9):

FIG. 3C illustrates a final portion of an exemplary embodiment of a database file layout used in one embodiment of the present invention;

Drawing Description Text (10):

FIG. 4 illustrates the high-level system description for the method of one exemplary embodiment of the present invention including database data analysis and presentation as part of a report to the practice;

Drawing Description Text (37):

FIG. 23 is an exemplary flow chart of the program to from a record and update a database with the information gathered from a survey form.

Detailed Description Text (2):

The present invention, designed for use in a large network of physician practices,

provides a system for acquiring, managing, analyzing, and summarizing patient clinical care information, practice management/cost information, patient satisfaction, and health care outcomes information gathered from a large network of physician practices. The system includes: (1) machine-readable surveys that include separate sections of predetermined length that are administered to physicians and patients; or (1a) a handheld computer that administers the same survey to physicians and patients; (2) a scanner for collecting and reading the machine-readable survey; (3) a database for receiving scanned raw data from the machine readable survey and patient clinical information, patient, practice and cost information as well as for receiving raw survey data from the hand held computer.

Detailed Description Text (3):

The system also includes a database processor for translating the three different categories of data: patient clinical care data, practice management/costs data, and patient satisfaction/health care outcomes data to a predetermined format and for storing the translated data into a database. The results of the analysis can be accessed by member physicians who dial up the report generation module with their questions or who receive periodic practice reports as part of a regular routine. Report information may be able to be immediately displayed or received as printed reports. The system of the present invention may provide, for example, a) more objective assessment of the patient's progress and effectiveness of management; b) the determination of the effectiveness of management; c) validation of the process criteria for clinical audit; and d) assessment of cost effectiveness.

Detailed Description Text (6):

The present invention relates to a system that (1) gathers clinical information (information about the physician's clinical decision-making, including the assessment, therapeutic plan, and health outcomes of that plan); (2) gathers physician/patient information (information about the relationship of the patient to the physician, to the physician's practice and to prescribed therapeutic regimens; (3) gathers practice management/cost information (administrative information); (4) creates a database of this information; (5) analyzes data within the database; and (6) provides selected results of analysis of the information as a report. The data can be analyzed to provide physicians information regarding (A) clinical decisions that have been made and the effectiveness of the treatment regimens prescribed in their practice in comparison with other physicians participating in the System; (B) the perception of quality of the physician's practice and care from the patients' perspective, including the effects of actions taken by the physician to increase the quality of the practice and reactions to the physician's prescribed therapeutic regimens; and (C) the costs and management processes for use in defining the relationship between the physician and the managed care company; and insurance companies.

Detailed Description Text (7):

FIG. 1 illustrates the high level block diagram of the Physician/Patient information management system of an embodiment of the present invention. The system includes an Enrollment Processor 101 including enrollment forms (ERFs) for individual physicians or practices, a first data collection section having machine-readable survey form (MRSF) 102 which is completed by a patient and physician during a treatment session at a physician's practice 120 and a Scanner 104 for reading the survey information responses from the form and translating these into a Physician/Patient/Management data, and a Database Processing Module 106 including Database 124 for receiving the Physician/Patient data and for populating a Physician/Patient information database by storing the Physician/Patient information in a predetermined format. The System further includes a Data Analysis Processor 108 for analyzing the Physician/Patient/Management information according to selected data analysis packages such as Statistical Package for the Social Sciences (SPSS) or SAS, a Report Generation Module 110 for generating formatted reports containing results determined by the Data Analysis Processor 108, and an Outcomes Measurement Module 112 for recording and tracking performance of the System.

Detailed Description Text (9):

The general operation of the process of the exemplary embodiment shown in FIG. 1 is now described. Each practice 120 completes an enrollment form which includes general information about the practice, and the enrollment process is described in detail subsequently. Prior to the clinical encounter, the patient form MRS 102 is prepared by writing relevant practice identification and management codes at the bottom of the form. For example, the practice's identification number is 000013 and the patient has a 15 minute appointment. Enough clipboards with the MRS Form 102, pens, and return envelopes are readied for each patient. During a clinical encounter at the physician

practice location 102, physicians and patients fill out the MRS Form 102 with specific information relating to the treatment session ("Clinical Information"). The MRS Form 102 includes a small section in which the physician indicates the patient's problem or diagnosis. In a further embodiment, any medications or other treatment or risk reduction regimens prescribed in the small section of MRS form 102. For this alternative embodiment, for example, the physician may prescribe oxygen and support group therapy to patient X.

Detailed Description Text (10):

In a further embodiment, a section of the MRS 102 is devoted to patient identity, including a unique identity code given to the patient and the identity code given to the healthcare provider. These codes may be used by the physician to obtain statistical summaries about practice 102. The MRS Form 102 also includes a section for the patient to indicate satisfaction with the services that the practice provides and reactions to the therapeutic regimens prescribed by the physician. To respond to these items, the patient X first reads each item e.g., "1. Availability of convenient parking/public transportation. The patient then reads the five alternative responses, "Very Satisfied," "Satisfied," "Neutral," "Dissatisfied," or "Very Dissatisfied." She decides that she is very satisfied by the parking and blackens in the bubble "Very Satisfied." She then moves on to the next item and, one by one, responds until one bubble is blackened for each item in the section.

Detailed Description Text (11):

Once the MRS Form 102 is completed, the form is scanned by the Scanner 104 which reads the Physician/Patient/Practice Management (PPPM) information and provides the scanned data to the Database Processing Module 106. Database Processing Module 106 converts the received Physician/Patient Information into data records having a predetermined format and populates the database with these records. Alternatively, the PPPM information may be entered manually if no scanner is available.

Detailed Description Text (13):

The data from the E-PDS 103 corresponding to responses to screens 103 are downloaded directly into Module 106 that converts these data records into the same predetermined format as those received from MRS 102 through scanner 104. Both of methods them responded that they were Very Satisfied with parking/availability of public transportation. Both patients' responses were formatted as a "1" (indicated very satisfied) as compared to "0" did not mark very satisfied. The data in the database are available for statistical manipulation and for inferential statistics. Preferably, the data derived from the stored PPPM information is considered statistically valid because it is derived from survey instruments, i.e. the survey questions, that are statistically-validated. and have been field tested on a human test group having a large number of patients. The patients are chosen to be a representative sample of a much larger practice population with wide variability of characteristics.

Detailed Description Text (14):

The PPPM information, in raw and digitized, form, from practices 120 are stored within the Database 124 in manner governed by database processing module 106. Database processing module 106 examines raw PPPM information to determine validity and then stores the PPPM information in a format which allows optimal use by Data Analysis processor 108. For example, all prescription information may be kept as records in one sub-database, the record including a unique patient identifier, and prescription information from a particular PPPM information set and patient identifier may be unknown, and is so identified as unknown in the record. Data Analysis processor 108 includes algorithms for processing the data. Storing PPPM information from the network of practices with the data processor enables statistically valid regional, national, and specialty comparisons to be made between different treatment practices, different levels of patient satisfaction and adherence, as well as different practice management costs.

Detailed Description Text (15):

Database section 124, for example, may contain PPPM information from multi-specialty, primary care physicians. The algorithms for processing PPPM information may contain coding to provide processed PPPM information according to age, severity of the problem, use of community resources, patient responses to their therapies, and other pertinent information. Consequently, if Patient X and patient Y have Chronic Obstructive Pulmonary Disorder (COPD), the COPD information, reactions to their care, the patient's satisfaction and the practice's costs of care are provided so that the care by the respective physicians of Patient X and Patient Y, who may practice in the suburbs of Philadelphia, may be compared with one another, as well as compared with other

multi-specialty, primary care physicians practicing in the city.

Detailed Description Text (16):

Next, the Data Analysis Processor 108 continually and periodically implements the specific algorithms using the PPPM information stored within the Database 124. Based on criteria defined in each algorithm, specific information contained in each record in the Database 124 of the Database Processing Module 106 is accessed by the Data Analysis Processor 108, the specific accessed data is processed, and results generated for use by each individual physician practice or other consumers of the results. The Data Analysis Processor 108 includes a data processing package that selects variables from each category of the database and analyzes the data with statistical packages (e.g., SPSS, SAS, etc) that are appropriate for the research/practice questions that have been posed.

Detailed Description Text (17):

For example, the respective physicians who treat Patient X and Patient Y may want to know the regional cost of pharmaceutical and community based therapies to their COPD patients, adherence of these patient to the prescribed regimens, and a comparison of costs to their respective practices to other practices in which pulmonologists treat COPD. Based upon criteria defined in the algorithm, specific information, such as the number and type of subspecialists in a practice is extracted from each record in the Database 124 by the Data Analysis processor 108. For example, the algorithm counts the number of times that the patient has seen the pulmonologist and the number of times that the patient has seen the generalist for COPD. The means and standard deviations of costs, adherence, and satisfaction of seeing both types of physicians are compared in multivariate studies.

Detailed Description Text (19):

Second, the Report Generation Module 110 generates real time reports in response to physician queries. For example, a Physician may need information comparing the historical data concerning satisfaction of patient treatment in order for the physician to determine whether a recently implemented change in treatment regimen improves or decreases patient satisfaction. These real time reports may be queried from and received locally by the physician through a dial-up modem connection from a personal computer (PC) 122 to the Data Analysis Processor 108.

Detailed Description Text (20):

Finally, the performance of the System is monitored and tracked by the Outcomes Measurement Module 112. In the exemplary embodiment of the present invention, the Outcomes Measurement Module 112 tracks the progress of perceived quality of a physician's practice. The module compares the individual practice's and network's clinical, physician patient and cost and management outcomes with similar practices from the same region and across the nation. The outcomes module is the part of the system that can directly lead to improvements to medical practice, patient satisfaction and practice management. After receiving its first outcome report, the physician or practice can begin to compare present results of the same practice with past results. The reports can show the effect over time of decisions made to improve quality of diagnosis, treatment, practice management, and patients perceptions of and responses to practice efforts. When changes do not occur and areas of the practice remain resistant to improvement, it may be necessary to make changes to the information that is gathered by the MRS 102 or the E-PDS 103.

Detailed Description Text (21):

A further aspect of the exemplary embodiment of the Outcomes Measurement Module is tracking of responses from patients, physicians, and the practice and correlating patient diagnosis and treatment outcomes and practice costs by the data analysis processor 108 with the patient responses to particular questions included in the surveys of MRS 102 and E-PDS 103. Strong correlation between patient responses and particular treatment outcomes (e.g. a 0.80 correlation between dissatisfaction with the manner of the doctor and non-adherence to a prescription for a Beta Blocker) are used to identify 1) patients who are "at risk" of an adverse outcome, either in the overall patient's perception of care or in health-outcomes and 2) aspects of a practice which require improvement.

Detailed Description Text (30):

Initially, a practice 120 enrolls in the system, which includes providing information about the practice, which may be accomplished through an enrollment form. Such practice information may include practice location, number of physicians, physician's names and specialty, number of exam rooms, number of patients and other general information.

Further, the enrollment may collect data which is related to patient population characteristics and costs of care delivery, such as the frequent zip-codes or geographic areas of the practice's patients, frequent billing codes (e.g. ICD-9 billing codes) and health care insurance information. Also collected may be specific cost information of the practice's business, such as the loaded costs associated with each physician, nurse and support staff; costs for the floor space of the practice, or costs of malpractice or other insurance.

Detailed Description Text (31):

Once the enrollment is complete, the practice information is stored through the enrollment processor 101 of FIG. 1 in the database 124 for use by the data analysis processor 108. Enrollment processor 101 may include a method by which occasional update forms are transmitted to practices 120 to update the enrollment information. Such process may be manual, or may be automatic through, for example, data entry via a dial-up Internet Web site. Once enrolled, the practice begins collecting PPPM information through MRS forms 102 and/or E-PDSs 103.

Detailed Description Text (33):

First, the physician must arrange so that at least one survey is completed per week for the particular measure to be monitored. For example, if the survey addresses the practice 120, any patient's survey fulfills this requirement; if, however, the measure is for COPD, then only patients treated for COPD fulfill this requirement. Next, the physician arranges the office procedures for handling patients so that the patient is handed either MRS 102 or E-PDS 103, and necessary postage/reply envelopes if the survey is filled out by the patient at home. Arrangement of office procedures may be: 1) place MRS 102 or E-PDS 103 in patient's chart, with appropriate physician/practice information entered at this time; 2) offer survey to patient at close of patient's clinical contact, with appropriate explanation of purposes, confidentiality and instructions; 3) If patient declines to provide survey, physician's office still provides unanswered survey with physician's input and indication that patient declined for data validity purposes; and 4) the group of surveys for a specified period is then delivered to the central database of the System 10.

Detailed Description Text (34):

FIG. 2A illustrates the format of the MRS Form 102 according to the one embodiment of the present invention. As shown, the MRS Form 102 includes Patient Satisfaction items 202, Wait and Service Time items 203, Demographic and Insurance items 204. Diagnostic and Treatment Items 205, and Optional Identification Section 206. Optional Identity Section 206 can be used for by the physician for internal use of the practice to identify the patient and the patient's managed care provider or insurance provider. FIG. 2B illustrates the MRS form 102 used in one exemplary embodiment, and FIG. 2C illustrates an alternative form used in another exemplary embodiment.

Detailed Description Text (38):

The survey items included on the MRS 102 and the E-PDS 103 have been carefully chosen to return the maximum amount of data, with a minimal requirement of effort by the patient filling out the form. The items relate to certain clinical information and overall satisfaction of the patient with respect to the physicians' diagnosis and the prescribed regimens as well as to selected practice variables and to the treatment session in general. Such questions of patient satisfaction include, but are not limited to, the areas listed in Table 1A, and questions related to time of the visit are listed in Table 1B.

Detailed Description Text (40):

In order to be easily answered, machine readable, and allow variability of response, the MRS survey 102 and the E-PDS 103 version of the survey are designed with a multiple choice format. The information contained on the form is scanned and electronically input to the Database 124, which can be, for example, a Microsoft SQL relational database, using a commercially available program, such as Microsoft Access, for later analysis. Each E-PDS 103 is downloaded directly into the Database 124 as subsequently described.

Detailed Description Text (42):

As previously described, the system 10 may include a personal disease management process, described subsequently, which also collects patient survey information related to a treatment regimen prescribed by the physician. The PDMA 105 receives a treatment profile from the host 107. The treatment profile may be a pre-defined treatment regimen for a particular disease or health management program which is tailored by the physician to a particular patient's treatment regimen. Such tailoring may be

accomplished by bringing the treatment profile up on the screen of the host 107 and the physician, nurse or other attendant enters, for example, prescription information and dosage, particular times to take medication or other aspects of treatment. The treatment profile may also contain a help file associated with a disease management program. The host then downloads the treatment profile to the PDMA 105. In an alternative embodiment, the treatment profiles are contained in a remote database (not shown) and downloaded to the host from the remote location for periodic updates.

Detailed Description Text (44):

In an alternative embodiment, the database 124 of FIG. 1 may maintain records of each PDMA 107 for each patient, and the host may be linked to the database 106 in real-time as a PDMA is programmed. Consequently, when a physician programs a treatment profile of a PDMA 107 for a specific disease treatment regimen, a search processor (not shown) may search the database 106 for other treatment regimens for the same patient. If a match occurs, the searching processor may determine if a potential problem or contraindication exists, and the physician is notified to modify the planned treatment regimen of the treatment profile.

Detailed Description Text (46):

The Physician/Patient Database Population and Management

Detailed Description Text (47):

As mentioned previously, the raw data representing PPPM information from the machine readable MRS Form 102 and E-PDS is stored in a database format; however, the information is subject to exception handling and other filtering to discard "bad" data, and is then processed. Exception handling can be accomplished, for example, by human intervention if the MRS Form 102 has been incorrectly filled out, by eliminating responses that show response set (i.e., that the respondent answers all items in the say way no matter how they are presented) or that are vastly different from the remaining responses, or that have large mounts of missing data. Once the raw data has been "smoothed" based upon a predetermined criteria, the information is stored in a database.

Detailed Description Text (48):

FIGS. 3A-3C illustrates an exemplary database file layout used in coding data for one embodiment of the present invention. The final column codes the data from the MRS 102 completed by patient X having COPD. The database program format of the exemplary embodiment is SQL. As shown, each patient response from a MRS Form 102 is summarized as one ASCII record. Each field is represented by ASCII printable codes, and each field is separated by tab characters. Records are terminated by carriage return and linefeed codes.

Detailed Description Text (50):

The Data Analysis Processor 108 can perform various forms of analysis on the records stored within the Database 124. The simplest form of analysis is the production of descriptive statistics for the data. To calculate a mean total score for satisfaction, for example, all of the individual responses are summed and then divided by the total number of satisfaction items. Similarly, the standard deviations, skew, etc. of the items can be calculated for each MRS Form 102 and E-PDS 103. These descriptive statistics are described in standard texts such as Mehrens and Lehman, "Basic principles of measurement in Measurement and evaluation in education and psychology. New York: Holt Rinehart and Winston, 1973, which is incorporated herein by reference. However, more complex analysis can be performed on the information contained in Database 124.

Detailed Description Text (51):

FIG. 4 illustrates the high level system description for the method of the exemplary embodiment of the System, including database data analysis and presentation. As shown in FIG. 4, the System collects physician and patient data from the MRS Form 102 or E-PDS 103 of FIG. 1 at step 402.

Detailed Description Text (52):

At step 404, the system receives the physician and patient data and audits the data for completeness and accuracy. This is a "simple" audit to see if all questions are answered, multiple responses were made to one question, patient really read and answered questions properly rather than randomly entered the values, or the entry values correspond properly with one another (e.g. female patient, but diagnosis or other questions indicate a male patient). If entries are found to be defective, the entry is tagged as defective, or set to "no response." However, all survey responses

are maintained for statistically validating the aggregate PPPM information of all responses. As discussed previously, such audit may be manual, or may be automated based on a particular criteria. At step 406, the formatted physician and patient data is stored in the relational Database 124 of FIG. 1.

Detailed Description Text (56):

According to step 406 of FIG. 4, the survey information items are transmitted to the database processing module 106 of FIG. 1, checked for accuracy and completeness, and stored into a relational database, database 124, in an unscored state by code values (e.g. "COPD" is assigned code value "300"). If the physician has a poor response rate to the survey process, an indication is sent to the physician.

Detailed Description Text (58):

Also at step 408, correlation statistics may be calculated to show relatedness among the variables of the database 124. For example, Patient RB may have a severity score of 3 (moderately serious) on a 1-5 scale. Patient SM has a severity score of 5. A correlation of 0.85 (p less than 0.005) between severity and cost shows that the severity score is highly related to cost, meaning that patient SM may require greater cost to deliver care. Comparisons between practices for the given data may also be shown such as the number of physicians decreases the correlation between severity and cost to 0.70.

Detailed Description Text (61):

Referring to FIG. 5, the extraction from the System 10 of specific information with the periodic reports or dial up inquiry is performed by report generation process 110 of FIG. 1. The algorithms of the Data Analysis Processor 108 selects a group of all records from a given physician and extract these records from the Database 124 at step 502. Next, at step 504, only those records meeting a predetermined time period are retained for further analysis. For example, RB's physician in Practice 120 decides to determine the level of adherence (1.00-3.00) to their medications of patients with a severity pulmonary disorder rating of >4. on a scale of 1.00 to 5.00 for COPD. At step 506, the records are grouped according to the specialty type and patient problem type (i.e., in this case, pulmonary patients in general practice.)

Detailed Description Text (66):

FIG. 6 gives a pictorial example of how values for groups of conceptually related physician variables may then be displayed together. From this pictorial comparison, hypotheses may be put forth concerning relationships between, for example, physician/patient data, outcomes data and cost data. For example, if the group of patient satisfaction variables for physician manner collectively show that a poor physician manner relates to poor adherence to therapeutic regimen, then the physician may attempt to improve patient responses to one or more of the variables related to physician's manner. The process of identifying trends and changes in response for hypothesis testing are known in the art, and may be found in, for example, in Norton et al., Primary Care Research: Traditional and Innovative Approaches, Research Methods for Primary Care, Vol. 1, Sage Publications, London, (1991), which is incorporated herein by reference.

Detailed Description Text (71):

In a further embodiment of the present invention, the enrollment process of a practice includes receiving costs associated with the practice, such as a loaded cost of a physician's time, a loaded cost of a nurses's time, etc. Since patients provide information as to length of time spent with different individuals within the practice, the cost of delivering care may be tabulated. Further, insurance information, which may be provided from a separate source, may be compared with means and variances of the practice's costs to provide care or treat certain types of diseases for certain patients. Further, median income information of patients and median practice information of other practices having the same specialties in the local or regional area may be used by practices giving elective care (plastic surgery, for example) to determine prices for certain healthcare options.

Detailed Description Text (73):

Once the data is available, the data is processed to provide periodic reporting by the Report Generation Module 110 of various types of information to each physician which the physician may use, for example, to improve the quality of the practice by identifying problem areas; identify new practice areas; or use during discussions defining the relationship between the managed care provider and the physician. Previously, with respect to the exemplary report of FIG. 6, a pictorial example of how values for groups of conceptually related physician variables may then be displayed

together. These groups of conceptually related physician variables may be termed "domains" and given in periodic reports to track improvement.

Detailed Description Text (78):

The second aspect of the reporting process is a dial-up or real time provider of analyzed database information. For an exemplary implementation, a PC having a "forms" format in, for example, a Windows environment can receive information in fields corresponding to the illustrated fields shown in the periodic printed report for immediate presentation. In addition, for the dial-up connection, the physician can query for particular information relating to physician defined variables: for example, the physician can define particular time periods, medications, or satisfaction levels for particular treatment regimens in particular geographic areas.

Detailed Description Text (80):

As previously described, an alternative embodiment of the present invention employs an electronic handheld computer to electronically prompt for and receive survey data, the E-PDS 103. This alternative embodiment may also employ a host device to collect more comprehensive physician diagnosis information. During a treatment session at the physician practice location 120, physicians and patients enter survey data into the E-PDS 103 with specific information relating to the treatment session ("Physician/Patient Information"). Prior to use by a patient, the electronic forms to be filled out by each patient are identified and retrieved from the Forms Library 112, and corresponding patient identification information (PID) is determined and registered in the Data Analysis Processor 108. The forms and PIDs are downloaded to the E-PDS 102 through E-PDS Interface 114.

Detailed Description Text (82):

Once the form displayed in the E-PDS 102 is completed, the information corresponding to the form is downloaded into the host 104 through E-PDS interface 114, and provides the Physician/Patient information to the Database Processing Module 106. The following describes an exemplary embodiment of the E-PDS 103.

Detailed Description Text (83):

Referring to FIG. 8, host device 107 may be implemented in a personal computer (PC), such as an IBM.TM. compatible with a Pentium.TM. processor, and E-PDS 103 may be implemented on a personal hand-held computer organizer, which may be a PalmPilot.TM. available from 3COM, Incorporated. An exemplary E-PDS 103 includes a survey, called a patient satisfaction form which may have 25 patient questions and 12 questions of the host device 107, a correlation number entry up to, for example, four digits, and a date and time stamp which is recorded by the pilot. FIG. 8 illustrates a typical configuration of electronic survey data collection in a physician's practice 120 for an exemplary embodiment of the present invention. The host device 107 downloads forms and receives completed survey information from E-PDS 103, is connected to a database processor 106 to provide uplinked, correlated survey, or PPPM, information, and is connected to optional printer 800 to print reports from the report generation module 110 of FIG. 1. As illustrated by FIG. 8, uplink information is provided from host 107 to database processor 106 through a dial-up access employing modem 801.

Detailed Description Text (84):

Host device 107 may include three possible interface screens: an administration menu, a physician data screen, and a correlation menu. The administration menu contains commands that allow a user to install a survey form onto an E-PDS, print physician forms and enter physician data, correlate and update survey data, and send the data to a remote database processor. The physician data screen allows the physician or nurse to enter physician data which may be a patient number (Patient ID), gender, initial visit or follow-up visit, data and time, three diagnoses, three medications, an insurance plan, an office or practice identification (Office ID) and Physician ID. The correlation screen shows unmatched patient data from a completed survey form, allows modification of patient ID of physician data, allows creation of new physician data, and deletion of unmatched physician data.

Detailed Description Text (85):

The host device 107 numbers (batch number) and tracks each set of survey data uploaded from E-PDSs and transmitted to a remote database processor 106 at the end of a collection period. Each survey is given a sequential patient ID number (Patient Number) up to four digits which is reset to 1 after each upload to the database processor 106. Physician diagnosis forms may be printed by the host device 107 and may contain both the Batch Number and Patient Number. Prior to giving the patient the E-PDS, each printed form is then attached to the patient's file for the physician to complete

during the patient's visit. Office staff enter the physician's information into the host, and download the survey form into the E-PDS 103 with the Patient Number correlated to physician's diagnosis. Using a hot-sync capability, the E-PDS's forms are downloaded to E-PDS and survey data collected from the E-PDS by the host device 107 by placing the E-PDS on a communication interface to the host 107, called a "cradle."

Detailed Description Text (86):

When the correlate functions are run, survey data is checked to ensure that no duplicate Patient Number entries are received from different E-PDSs. If a duplicate or missing patient number is found, these are provided through a screen on the host to an operator (nurse, receptionist, etc.) The operator may then correct or provide the correct patient number, possibly by going through the daily appointment schedule and correlating data present (e.g. male/female, purpose of visit, time of visit, and time/date-stamp) to known information. If duplicate entries are found, one method would be to accept either the older or the newer data and delete the other survey data. Next, the survey data and physician (diagnosis) records are correlated using Patient Number. Two errors are possible: physician data and no survey data, or survey data and no physician data. In the first case, the data may be deleted or transmitted to the database process; in the second case the operator may try to match the survey record with a patient, allowing the physician to re-enter the physician diagnosis data.

Detailed Description Text (87):

Finally, the host device assigns a batch number to the correlated survey and physician data, and uploads the information to the database processor 106 as a Batch file with corresponding Batch number. The batch number is then incremented for the next group of PPPM information.

Detailed Description Text (88):

FIG. 13 illustrates an exemplary process flow followed by a practice 120 to collect survey data with the exemplary embodiment of FIG. 8. First, at step 1302, the receptionist prints physician diagnosis data (PDD) forms for the day. Next, at step 1304, the patient for whom a form is printed enters the office. At step 1306, the receptionist attaches the PDD form to the patients chart, noting patient insurance and physician ID information on the form.

Detailed Description Text (90):

During the day, the E-PDS may collect up to a predetermined number of sets of patient survey data. At step 1318, the receptionist enters the information on the PDD forms into the host device, and downloads the sets of patient survey data from the E-PDS into the host at the end of the day. Next, at step 1320, the receptionist runs a correlate function on the PDD and patient survey information. Finally, at step 1322, at the end of the week, the receptionist sends the batch data to the database processor for population of the database.

Detailed Description Text (91):

FIGS. 14A through 14E illustrate exemplary window screens of the host device 107. FIG. 14A illustrates the main menu of options of the exemplary embodiment activated by clicking the appropriate icon "button": an install program 1400, a print forms 1401, an update 1402 to update the patient/physician data, a correlate 1403 to correlate the physician diagnosis and patient survey data, an enter data 1404 to enter physician diagnosis and patient data, a send 1405 to initiate an upload of data from host 107 to database processor 106, and an exit 1406 to end the program. FIG. 14B illustrates a print forms screen. FIG. 14C illustrates a correlate screen of the an exemplary embodiment of the host device of the present invention allowing modification of duplicate or missing survey information based on patient number. FIG. 14D illustrates a correlate screen of the an exemplary embodiment of the host device of the present invention allowing modification of incomplete information such as missing patient or physician data. FIG. 14E illustrates an enter data screen of the an exemplary embodiment of the host device of the present invention.

Detailed Description Text (93):

FIG. 15 is an exemplary flow chart of a program to start the survey process and wait for an event when the E-PDS is started. First, at step 1501, the program initializes, and at step 1502 determines if a normal software application of the hand-held computer is enabled. If so, the survey program exits (returns 0); otherwise, at step 1503, the survey program disables standard handheld functions, or graffiti, loads the first screen to receive the patient identifier (ID) and starts the event loop process (each event is the keying if data from a screen of the handheld computer).

Detailed Description Text (97):

FIG. 19 is an exemplary flow chart of a end handle event sub-routine program of FIG. 17 which ends the survey by ending event processing as indicated to the E-PDS screen. When the end handle event routine is enabled at step 1901, at step 1902 a test is made to determine if the form has not been loaded (the form open event). If the screen is not loaded, at step 1903 the final screen of the survey form is drawn on the screen and the database is updated by calling the update database routine; otherwise, at step 1904 a test is made to determine if the event is pressing of a keypad key. If a keypad key is pressed, the key state, or value, is retrieved at step 1905. A test is made at step 1906 to determine if both keys 1 and 2 were pressed, and if so the initial patient form is loaded at 1907, ready to receive the patient ID to begin a new survey.

Detailed Description Text (98):

FIG. 20 is an exemplary flow chart of a subroutine program which processes a buttons handle event to check if a survey question is answered and move to the next question. When the buttons handle event is enabled at step 2001, a test is made at step 2002 to determine whether the survey form is to be drawn on the screen. If so, the form is drawn at step 2003; if not, a test is made at step 2004 if a data entry event has been made. If so, a test is made to determine if the "next" data value was pressed at step 2005. If the next button was pressed, then at step 2007 a test is made to determine if the data for the question of the form has been answered. If not, at step 2006 an error message is displayed. If the data has been entered, then the database update routine is called and the next survey form is loaded at step 2008.

Detailed Description Text (99):

FIG. 21 is an exemplary flow chart of a sub-routine program which enables data entry for a predetermined set of survey questions which have yes/no answers. When the Q9 handle event is enabled at step 2101, a test is whether the survey form is to be drawn on the screen at step 2102. If so, the form is drawn at step 2103; if not, a test is made at step 2104 if a data entry event has been made. If so, a test is made to determine if the "next" data value was pressed at step 2105; If so, then at step 2106 the data entry is tested for a "no" value. If the data value is not "no", then the value is tested for a "yes" value at step 2108. If the answer is not "yes" at step 2108, then an error value is displayed at step 2109; If the answer is "yes", then at step 2110 the update database routine is called for selected questions, and the last form of the group is loaded. If the answer at step 2106 was a "no", then at step 2107 the update database routine is called and the next form is loaded.

Detailed Description Text (101):

FIG. 23 is an exemplary flow chart of the program to from a record and update a database with the information gathered from a survey form. As shown in FIG. 23, at step 2301 the update database routine is enabled, and at step 2302 a processor attempts to find an existing database. If the database is found at step 2303, at step 2305 the database is opened, a new record of the survey data is created, the answers are written for the record, the database is closed, and the program resets to begin a new survey application. If the database is not found at step 2303, at step 2304 a new database is created, and the program then proceeds to step 2305.

Detailed Description Text (102):

Appendix C provides an exemplary database format for a particular embodiment of the present invention; similarly, Appendix D provides an exemplary software hierarchy for software programs according to the flow charts as illustrates in FIGS. 15-23

Detailed Description Text (104):

In the exemplary embodiment described, the electronic forms shown are related to a particular treatment. However, the forms, and the content of the forms, can be tailored to, for example, the particular diagnosis or treatment, particular patient, or particular practice or specialty.

Detailed Description Text (107):

According to one aspect of the present invention, the System for data collection improves processing of database information through system performance measurement. The outcomes measurement process tracks the progress of perceived quality of a physician's practice, as well as based on a regional or national comparison. In another embodiment, the performance of a physician's efforts to improve quality of diagnosis, treatment and are also compared against the processed information both historically and regionally. In another embodiment, those areas of practice performance identified by processed information which are resistant to improvement efforts by physicians despite being identified are analyzed to improve the information gathering aspects of the machine

readable forms.

Detailed Description Text (108):

A further aspect of the invention regarding the "self learning" of the outcomes measurement tracking is the ability of the system to correlate patient diagnosis, treatment outcomes, and the patient responses to particular questions of the machine readable form. A strong correlation between patient responses and particular treatment outcomes are used to identify patients who are "at risk" of an adverse outcome, either in the patient's perception of care or in the patient's actual health outcome. For example, for a particular diagnosis or treatment for adverse mental health outcomes, such as depression, the data may show a particular correlation to low satisfaction scores in several questions. Therefore, a physician who receives a survey from a patient during a treatment session which has low satisfaction scores in those questions is alerted to the possibility that the patient may possibly have the adverse mental health outcome.

CLAIMS:

1. A system for acquisition, management and processing of patient clinical information and patient satisfaction information received from a plurality of physician practices to provide practice performance information for a physician practice, the system comprising:

means for receiving data from a survey form, the data including a physician component to receive the patient clinical information and a patient component to receive the patient satisfaction information, to provide practice-patient data;

database processing means for translating the practice-patient data to a predetermined format and for storing the practice-patient data having the predetermined format in a database;

data analysis means for

- a) selectively receiving practice-patient data from the database,
- b) analyzing the received practice-patient data, and
- c) summarizing the patient satisfaction information with respect to the clinical information to provide performance results of the physician practice; and

data correlating means for correlating selected portions of the performance results associated with at least one of the plurality of physician practices with portions of the stored practice-patient data to provide a practice measure; and

reporting means for generating a report from the performance results and the practice measures,

wherein data correlating means correlates selected portions of the performance results to provide the practice measure as a relative measure of practice quality based on a comparison of the patient satisfaction information of the plurality of physician practices.

6. The system as recited in claim 1, further comprising:

outcomes measuring means including processing means for

- a) periodically selectively receiving performance results,
- b) storing the selected performance results,
- c) identifying a trend present in the stored performance results, and
- d) tracking a trend present in the stored performance results.

11. The system as recited in claim 1, wherein:

the system is a personal disease management assistant system, and wherein the means for receiving data comprises:

a hand-held computer, the hand-held computer: storing at least one survey form, each survey form including at least one section to receive the patient clinical and satisfaction information, wherein the survey form is presented as a plurality of screens on the hand-held computer, each screen including at least one survey question, the hand-held computer:

- 1) receiving each response value to each respective question as one portion of the patient clinical and satisfaction information; and
- 2) storing at least one disease profile, the disease profile including at least one of a treatment regimen and a prescription regimen;

wherein the handheld computer includes means for 1) associating each survey form with the disease profile and 2) indicating a treatment event based on the disease profile, wherein the handheld computer provides at least one survey form associated with the treatment event; and

wherein the database processing means further comprises

a host computer having a communications interface to the hand-held computer, the host computer receiving the patient clinical and satisfaction information from the hand-held computer through the communications interface to provide practice-patient data.

12. A system for acquisition, management and processing of patient clinical information and patient satisfaction information received from a plurality of physician practices to provide practice performance information, the system comprising:

a hand-held computer, the hand-held computer storing at least one survey form, the survey form including at least one of a physician section to receive the patient clinical information and a patient section to receive the patient satisfaction information, wherein the survey form is presented as a plurality of screens on the hand-held computer, each screen including a single survey question, the hand-held computer receiving each response value to the respective question as one portion of the patient clinical information and the patient satisfaction information;

a host computer having a communications interface to the hand-held computer, the host computer receiving the patient clinical information and the patient satisfaction information from the hand-held computer through the communications interface to provide practice-patient data;

database processing means for translating the practice-patient data to a predetermined format and for storing the practice-patient data having the predetermined format in a database;

data analysis means for

- a) selectively receiving practice-patient data from the database,
- b) analyzing the received practice patient data, and
- c) summarizing patient satisfaction information with respect to the clinical information to provide performance results of the physician practice;

data correlating means for correlating selected portions of the performance results associated with at least one of the plurality of physician practices with portions of the stored practice-patient data to provide a practice measure; and

reporting means for periodically generating a report based on the performance results,

wherein data correlating means correlates selected portions of the performance results to provide the practice measure as a relative measure of practice quality based on a comparison of the patient satisfaction information of the plurality of physician practices.

13. The system as recited in claim 12, wherein the host computer further includes means for receiving and storing at least one physician diagnostic information record and an associated patient identification (ID), the handheld computer associates the patient ID with each survey form, and the host computer associates the received the patient clinical information and the patient satisfaction information of each respective form

with the physician diagnostic information record of which the patient ID matches the patient ID of the respective form to form a physician/patient data pair having the respective patient ID.

14. The system as recited in claim 13, wherein the host computer further includes a correlation processor, the correlation processor receiving each physician/patient data pair, and the correlation processor including means for comparing patient clinical information, the patient satisfaction information, and the physician diagnostic information of the physician/patient pair to identify at least one data exception, and includes means for resolving each data exception.

15. The system as recited in claim 12, wherein the database further includes a plurality of survey forms, the host computer includes a database interface, and means for downloading and storing selected ones of the plurality of survey forms, and the at least one survey form of the handheld computer is received through the communications interface from the host computer.

17. A method of acquisition, management and processing of patient clinical information and patient satisfaction information received from a plurality of physician practices to provide practice performance information, the method comprising the steps of:

- a) providing, with a survey form, survey questions including a physician section including questions related to the patient clinical information and a patient section including questions related to the patient satisfaction information;
- b) receiving data representing answers to the questions;
- c) providing the patient clinical information and the patient satisfaction information as practice-patient data;
- d) translating the practice-patient data to a predetermined format;
- e) storing the practice-patient data having the predetermined format in a database;
- f) selectively receiving practice-patient data from the database;
- g) analyzing the received practice patient data;
- h) summarizing patient satisfaction information with respect to the clinical information to provide performance results of the physician practice;
- i) correlating selected portions of the performance results associated with at least one of the plurality of physician practices with portions of the stored practice-patient data to provide a practice measure; and
- j) periodically generating a report of the practice measure based upon the provided performance results,

the report providing the practice measure as a relative measure of practice quality based on a comparison of the patient satisfaction information of the plurality of physician practices.